

WHAT IS CLAIMED IS:

1. An abrasive electrolyte solution adapted for thinning a layer on a substrate without contaminating the substrate, the abrasive electrolyte solution comprising:
an electrically conductive fluid that is substantially free of materials that are
reactive within a desired operating voltage potential range and
substantially free of materials that inhibit desired reactions within the
desired operating voltage potential range, and
abrasive particles having a size that is small enough for the particles to
substantially remain in suspension in the electrically conductive fluid and
is large enough for the particles to provide a desired degree of erosion of
the layer on the substrate when the abrasive electrolyte solution is forced
against the layer on the substrate.
2. The abrasive electrolyte solution of claim 1, wherein the substrate is a semiconducting substrate including integrated circuits.
3. The abrasive electrolyte solution of claim 1, wherein the layer comprises a first electrically conductive layer, an underlying non electrically conductive barrier layer, and an intervening electrically conductive seed layer.
4. The abrasive electrolyte solution of claim 1, wherein the layer comprises copper.
5. The abrasive electrolyte solution of claim 1, wherein the size of the abrasive particles is between about fifty nanometers and about two hundred and fifty nanometers.
6. The abrasive electrolyte solution of claim 1, wherein the desired operating voltage potential range of the abrasive electrolyte solution is between about one tenth of a volt and about one hundred volts.
7. The abrasive electrolyte solution of claim 1, wherein the desired reactions comprise oxidation of the layer on the substrate, where the layer is electrically conductive.

8. The abrasive electrolyte solution of claim 1, wherein the desired reactions comprise oxidation of the layer on the substrate, where the layer is copper.
9. An abrasive electrolyte solution adapted for thinning an electrically conductive layer on a semiconducting substrate including integrated circuits, without contaminating the substrate, the abrasive electrolyte solution comprising:
an electrically conductive fluid that is substantially free of materials that are
5 reactive within a desired operating voltage potential range and
substantially free of materials that inhibit desired reactions within the
desired operating voltage potential range, and
abrasive particles having a size that is small enough for the particles to
substantially remain in suspension in the electrically conductive fluid and
10 is large enough for the particles to provide a desired degree of erosion of
the layer on the substrate when the abrasive electrolyte solution is forced
against the layer on the substrate.
10. The abrasive electrolyte solution of claim 9, wherein the layer comprises a first electrically conductive layer, an underlying non electrically conductive barrier layer, and an intervening electrically conductive seed layer.
11. The abrasive electrolyte solution of claim 9, wherein the layer comprises copper.
12. The abrasive electrolyte solution of claim 9, wherein the size of the abrasive particles is between about fifty nanometers and about two hundred and fifty nanometers.
13. The abrasive electrolyte solution of claim 9, wherein the desired operating voltage potential range of the abrasive electrolyte solution is between about one tenth of a volt and about one hundred volts.
14. The abrasive electrolyte solution of claim 9, wherein the desired reactions comprise oxidation of the layer on the substrate.

15. The abrasive electrolyte solution of claim 9, wherein the desired reactions comprise oxidation of the layer on the substrate, where the layer is copper.
16. A method for thinning a layer on a substrate, the method comprising the step of forcing an abrasive electrolyte solution against the layer on the substrate while applying a voltage potential through the abrasive electrolyte solution between the substrate and a second electrode, where the layer is thinned both physically by the abrasive electrolyte solution and electrolytically by the voltage potential applied
5 through the abrasive electrolyte solution.
17. The method of claim 16, wherein the abrasive electrolyte solution is forced against the layer on the substrate with a polishing pad.
18. The method of claim 16, wherein the abrasive electrolyte solution is forced against the layer on the substrate with a brush.
19. The method of claim 16, wherein the abrasive electrolyte solution is forced against the layer on the substrate with a spray.
20. The method of claim 16, wherein the layer includes copper and the substrate is a semiconducting substrate including integrated circuits.